Centrality Determination in the Fixed-Target Program at STAR

Zachary Sweger
(For the STAR Collaboration)

University of California - Davis
zwsweger@ucdavis.edu

Abstract

The Glauber Model has long been used in heavy-ion collisions as a method of determining centrality by simulating nucleus-nucleus collisions and producing particles using a Negative Binomial Distribution (NBD). The core task is to determine what values of the negative binomial parameters and the hardness scaling reproduce the observed distributions from data, and assess whether adjustments to the particle production model are necessary to model multiplicities in the Fixed-Target Program (FXT). Particle production in heavy-ion collisions scales with the number of binary nucleon collisions for hard processes and with the number of participant or wounded nucleons for soft processes; the hardness scaling is an essential part of the Glauber Model and determines what fraction of produced particles are generated from soft versus hard processes. STAR has produced two fixed-target data sets at $\sqrt{s_{NN}} = 3.0$ GeV and 7.2 GeV which provide a unique opportunity to test the traditional particle production model. Attempts are made to fit simulated multiplicities to observed FXT multiplicity distributions using the hardness parameter and the negative binomial parameters. Several modifications to the particle production model will be explored.